Leonardo Badea[1]

CAPM IN THE FRAMEWORK OF CURRENT EUROPEAN CAPITAL MARKET

The paper shows the necessity of the CAPM appearance and development, its applicability, the role of beta in this model, as well as its extensions and criticism. The CAPM distinguishes between the types of risk to which an entity is subject at a market: the risk specific to a firm (unsystematic risk) and the risk stemming from the overall market evolution (systematic risk). Any investor is subject to a certain degree of risk when investing in a market and investment performance may be better or worse than the level of expectations. This case study presents the capital market institutions in France, main stock exchanges, major stock indices and their evolution in the period 2005-2010, ending with the analysis of 10 major titles listed at the stock market in France.

Keywords: *risk, risk-free assets, financial crisis, volatility, profitability.*

JEL classification: *G01,G11, G15.*

Леонардо Бадеа

МОДЕЛЬ CAPM У РАМКАХ СУЧАСНОГО ЄВРОПЕЙСЬКОГО РИНКУ КАПІТАЛУ

У статті показано виникнення і розвиток моделі оцінювання капітальних активів (CAPM), можливість її застосування, роль β у цій моделі, а також можливості її розвитку і недоліки. CAPM розрізняється за типами ризиків, яким суб'єкт піддається на ринку: ризики, специфічні для фірми (несистематичний ризик), і ризики, що випливають із загальної еволюції ринку (систематичний ризик). Будь-який інвестор піддається певному ступеню ризику при інвестуванні в ринок і результат його інвестиційної діяльності може виявитися вище або нижче рівня очікувань. Досліджено інститути ринку цінних паперів у Франції, основні біржі, основні фондові індекси та їх розвиток у період 2005-2010 рр., проаналізовано 10 основних учасників фондового ринку Франції.

Ключові слова: *ризик, безризикові активи, фінансова криза, волатильність, рентабельність.*

Таб. 2. Фор. 51. Літ. 16.

Леонардо Бадеа

МОДЕЛЬ CAPM В РАМКАХ СОВРЕМЕННОГО ЕВРОПЕЙСКОГО РЫНКА КАПИТАЛА

В статье показано возникновение и развитие модели оценки капитальных активов (CAPM), возможность ее применения, роль β в этой модели, а также возможности ее развития и недостатки. CAPM различается по типам рисков, которым субъект подвергается на рынке: риски, специфичные для фирмы (несистематический риск), и риски, вытекающие из общей эволюции рынка (систематический риск). Любой инвестор подвергается определенной степени риска при инвестировании в рынок и результат его инвестиционной деятельности может оказаться выше или ниже уровня ожиданий. Исследованы институты рынка ценных бумаг во Франции, основные биржи, основные фондовые индексы и их развитие в период 2005-2010 гг., проанализированы 10 основных участников фондового рынка Франции.

Ключевые слова: *риск, безрисковые активы, финансовый кризис, волатильность, рентабельность.*

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Introducing CAPM. CAPM, the model for evaluation of financial assets at capital markets (Dragota et al., 2003, p. 88-91), is one of the most widely recognized models in finance. Remarkable contributions to its design and development can be attributed to William Sharpe (1964, p. 425-442), John Lintner (1965), Jan Mossin (1966, p. 768-783), Fischer Black (1972, p. 444-455), but the list is certainly not exhaustive.

The emergence and development of CAPM (capital assets pricing model) are based on the diagonal model of the portfolio selection, being in fact a continuation of it. This model summarizes the results of portfolio diversification with the total risk components (Olteanu and Olteanu, 2000, p. 246-247).

1. Applicability of CAPM. The role of beta in CAPM. CAPM most often applies to basic securities markets (stocks, bonds) traded at stock exchanges. Yet, the number of stocks listed at these markets is too small (for example, there were 2,381 shares listed at the NYSE in July 2002) to make an empirical analysis of such securities and to generate new efficient frontiers.

Consequently, the obvious simplification is given by the exclusion out of a possible portfolio of a significant number of assets (which are not in the basic category of financial assets). This simplification has at least 2 major implications:

- Ensuring the enhancement of management skills by the fact that primary titles have higher liquidity, information concerning them being more accurate and complete;

- Loss of focus on certain investment opportunities, which is why the market portfolio used in portfolio management is no longer a real financial market portfolio, but rather a portfolio of the capital market or even a segment of it.

Despite its limits, CAPM has found many applications in professional finance:

- Within a company's finance, the cost of capital determines the acceptance or rejection by applying future cash-flows of a project. The weighted average of cost of capital is debt (plus corporation tax) and equity. The latter can be obtained by estimating the beta coefficient of firm action at a market; it equals the risk-free rate multiplied by beta coefficient of the market risk premium. If a project risk is different from that of the average firm projects, then a beta specific to that project can be estimated.

Portfolio managers as well as their customers should evaluate the quality of their work and the assessment requires accurate models to explain the formation of market return. CAPM is one of these models (Gomez and Zapatero, 2003, p. 343-357).

Placing key points of market shares in a plane where the security market line is represented, some titles will be positioned above this line and some others below it, except for the errors caused by particular conditions of sampling. The titles placed above the line mark the super-performance and can be incorporated into portfolios likely to successfully penetrate the market (for the same return on average it has a lower market risk). The role of beta in the model is to represent the sensitivity of the rate of return of shares in relation to the overall market fluctuations. Comparing the rate of market return and that of the market action for different periods, the risk is the systematic risk or beta paid in units of market risk (Dufloux, 2002, p. 31-32).

The basic principle of this model is to decompose the fluctuations of a title according to its 2 origins: on the one hand, intrinsic risks specific to the issuer and its

sector, on the other hand, systematic risks (also called market risk) that affect wider economy and its market and which give market orientation up or down, influencing each title.

If we leave aside the inherent risks that cannot be generalized, the only possible overview study is focused on systematic risks; this study is especially important for portfolio management, due to the fact that each title reacts differently to market fluctuations.

Certainly, most titles tend to follow the market, but this development may be of higher or lesser intensity, so the role of beta coefficient is to assess it.

There are 3 possible situations:

- The first case: beta > 1. The financial asset increases according to market changes. It is an offensive title: it grows faster than market, if market is growing, but it also decreases faster than market, if market is in decline;

- The second case: beta = 1. The financial asset reacts in simultaneity with the market. Generally speaking, the market beta coefficient is by definition always equal to 1.

- The third case: beta < 1. The financial asset depreciates market fluctuations. When beta is between 0 and 1, the title tends to follow market fluctuations, but in an attenuated manner; it is a defensive title (or neutral, that is equal to 1).

It is worth mentioning the scarcity of shares with a negative beta which are therefore in contradiction with market evolution. During a serious international crisis, only the shares that can practically last are those related to gold (gold mining titles).

Beta is a most important parameter for efficient management of portfolio units. Therefore, knowledge of it is of great importance, being used daily by every manager of titles in the stock market developments. If an overall market index is expected to increase, that manager will buy shares and increase the share of high and very high volatility because they will record profitability increases that are higher than the overall market growth and vice versa (Olteanu, Olteanu, 2000, p.199-200). The beta coefficient of the share "i" equals "covariance" (σ_{ip}) of the return action "i" and of the stock market relative to the overall profitability of the dispersion rate securities market:

$$\beta = \frac{\sigma_{ip}}{\sigma_p^2} \tag{1}$$

in which "covariance" $\sigma_{ip} = \frac{1}{n}\sum(r_i - \overline{r_i})(r_p - \overline{r_p})$ and $n =$ the number of observations on return rates.

From the same system of equations resulting from the method of the least squares and used to calculate the beta coefficient (β), we obtain the parameter alpha (α) of the regression function, which is the return that could be obtained for the share "i" if the market return would be zero:

$$\alpha = \frac{\sum r_i \sum r_p^2 - \sum r_p \sum r_i r_p}{n \sum r_p^2 - (\sum r_p)^2} \tag{2}$$

2. Application of CAPM at the capital market in France.

2.1. Major stock market indices of France. Their development over the period 2005-2010. The stock market indices allow quick evaluation of the movements taking place

at stock market. This is actually the objective of the indices containing a small number of titles. Each stock market has its representative indices. These indices lead to the assessment of the market as they include the titles with the largest market capitalization and thus they can represent a high percentage of the total stock market capitalization (Amenc and Le Sourd, 2002, p. 39-40).

On the other hand, indices serve as a reference for investors. Thus, there are indices containing a large number of titles as well as indices specialized in a particular sector of activity. European indices can be added in this context, that have been created recently and which represent both wider European market and international indices.

The calculation method widely used for constructing the index is market capitalization weighting. The best known indices are the Dow Jones and Nikkei, which are exceptions to this method of calculation, since they represent the average prices of the assets that compose them.

La Societe des Bourses Francaises (SBF) publishes several indicators that allow the representation of French stock market. These indices are obtained by weighted arithmetic average of market capitalization.

CAC 40 index is the main reference index of the Stock Market in Paris. It is calculated from the sample of 40 primary market securities, selected out of the top 100 in terms of market capitalization.

SBF 120 index was created in 1991 and comprises 120 titles, the most active and liquid ones, selected from the top 200 in terms of market capitalization.

SBF 80 index was created in 1997 and contains 80 titles of the SBF 120, but not contained in the CAC 40.

SBF 250 index, which replaced the CAC 240, consists of 250 stocks listed at the primary or secondary market and contains 120 titles of SBF 120 index. The selection of the titles is based on their representation degree in 12 economic sectors and on the regularity of their listing.

MIDCAC index consists of 100 orientative titles out of the average titles listed by Paris Stock Exchange securities. It contains the indices belonging to both SBF 120 and SBF 250 indices and the titles that are not listed at any stock index. This index provides managers of funds specialized in average values a baseline for assessing their performance.

Table 3. **Evolution of key indices in France for the period 2005-2010, %**

No.	Index	2005	2006	2007	2008	2009	2010
1.	CAC 40	6,45	10,72	1,67	-16,16	-12,76	8,28
2.	SBF 120	6,64	11,57	2,46	-16,01	-12,20	7,27
3.	SBF 80	7,14	18,00	7,13	-15,02	-8,20	7,27
4.	MIDCAC	11,05	20,14	5,07	-10,78	-7,45	8,88

Source: Global Index Group Monthly Performance Report March 2010.

2.2. Analysis of 10 major titles listed at the stock market in France. In order to perform the analysis, 10 titles were selected based on the following criteria: the titles were listed at NYSE Euronext Paris market, in terms of market capitalization they belonged to A segment (blue chips), i.e. they had a market capitalization more than 1 bln euros, the investment area was France and finally they were well-known in Romania.

ACCOR - ranks first in European hotel groups. The turnover is spread over the following activities: hotel services — 74.5%, pre-paid service (restaurant tickets, travel vouchers, gift vouchers etc.) — 12.6%, casinos — 4.5%, train rendered services — 3.9%, restaurants — 2.4%, others — 2.1%. The geographical distribution of the turnover is as follows: France — 36%, Europe — 37.9%, North America — 8.8%, Latin America and the Caribbeans — 8.6%, others — 8.7%.

BNP Paribas is the first French banking group. The net banking product of the activities is allocated as follows: banks (general activities) — 63.1%, insurance — 18.2%, financing and investment banks — 18%, others — 0.07%. The geographical distribution of the BNP group is as follows: France — 44.9%, Europe — 30.9%, America — 14.7%, Asia — 4.6%, 4.9% — elsewhere.

Groupe Societe Generale is among the top French banking groups. The net banking product of the activities is allocated as follows: banks (general activities) — 61%, financing and investment banks — 27.6%, assets management — 11.4%. Groupe Societe Generale is distributed geographically as follows: France — 43%, Europe — 38.9%, America — 9.1% Africa — 5.4%, Asia — 2.9% and Oceania — 0.7%.

Danone is listed among the top global food groups. The turnover by product groups is divided as follows: the category of fresh dairy products (yoghurts and desserts, Danone Activia, Actimel, Danette brands) ranks first in the world with 57.1%, baby food and medical nutrition products — 24%, the category of beverages (Evian, Volvic, Badoit, Aqua bottled water) ranks the second in the world with 18.9%. The geographical distribution of the turnover is as follows: Europe — 62.6%, Asia Pacific — 12.2%, 25.2% elsewhere.

Dior is a holding company whose activity is organized around 7 poles as follows: sales of fashion items and leather goods (including Louis Vuitton, Celine, Givenchy, Kenzo, Berl, Pucci, Donna Karan, Fendi) are 33.2% of the turnover with selective distribution (activity provided through Sephora, DFS, Le Bon Marche), 24.2%, sales of wine (Cape Mentelle, Chateau d'Yquem, champagne Moet & Chandon, Mercier, Veuve Clicquot, the number one worldwide) and spirits (brandy, especially Hennessy, number one in the world and whiskey, in particular Glenmorangie) — 17.3%, sales of perfumes (Christian Dior, Guerlain, Kenzo etc.) and cosmetics (Make Up For Ever, Guerlain, Acqua di Parma etc.) — 15.8%, sales of watches (Montres Dior, TAG Heuer, Chaumet, Zenith) — 4.8%, designing, manufacturing and sales of luxury products (leather goods, clothing, jewellery, glasses) — 4.2%, other activities — 0.5%. The geographical distribution of the turnover is as follows: France — 15.3%, Europe — 23.7%, Japan — 10.3%, Asia — 19.6%, US — 22.4%, 8.7% elsewhere.

GDF Suez is among the top suppliers of natural gas in Europe. The group offers parallel services in the fields of energy and environment. The turnover on activities is allocated as follows: production and international sale of gas and electricity — 35.5%, production and sale of gas and electricity services in France — 17.5%, energy service — 17%, environmental service benefits (distribution of drinking water and residual water treatment, collection and waste treatment facilities design and construction) — 15.4%, natural gas exploration and production (activity carried out notably in France, Germany, Belgium, England, Romania and Slovakia) — 1.3%. The geo-

graphical distribution of the turnover is: France — 38.4%, Belgium — 14.5%, Europe — 33%, North America — 5.8%, and 8.3% elsewhere.

L'Oreal is the global leader in cosmetics. The turnover by products is distributed as follows: cosmetics (especially make-up products) — 27.5% of turnover, hair care products — 27.2%, skin care products 23.1% of the turnover, hair dye — 18.8%, others — 3.4%, sold under the following brands: Kerastase, Garnier, L'Oreal Professionnel Paris L'Oreal, Maybelline, Matrix, Laboratoires Vichy, Biotherm, La Roche-Posay, Lancome, Helena Rubinstein, Ralph Lauren, Cacharel, Giorgio Armani etc.) — 93.2%, dermatological products — 2.4%, and the remaining 4.4% is natural cosmetics products (The Body Shop brand). The geographical distribution of the turnover is as follows: Western Europe — 45.5%, North America — 23.8%, 30.7% elsewhere.

Michelin are among the world leaders in manufacturing and marketing tires. Michelin Group products are marketed under the names of the following brands: Michelin, BFGoodrich, Kleber, Uniroyal and Taurus. Their turnover on activities is allocated as follows: sales and distribution of tires (having their own chains of distribution: Euromaster and TCI) — 86.3%, other activities (sale of tires for agricultural machinery, publishing maps and travel guides, car accessories etc.) — 13.7%. The geographical distribution of their turnover: Europe — 45.6%, North America — 33.7%, 20.7% elsewhere.

Peugeot is the second largest European manufacturer of cars. The turnover is distributed as follows: — 79% car sales, sales of car equipment — 15.3%, financing services for sales (Bank PSA Finance) — 3.2%, transport and logistics services — 2.2%, other activities (production and sale of motorcycles) 0.3%. The geographical distribution of their turnover: Western Europe — 79.3%, other countries in Europe — 5.9%, Latin America — 6.7%, 8.1% elsewhere.

Table 4. **Computation and interpretation of specific indicators**

Title	Annual Return (%)	Dividends distributed (million Euros)	Rate of dividend distribution (%)	Dividend/ share (Euros)	PER
Accor	2.69	396	140.42	1,05	31.11
BNP Paribas	1.79	488	8.37	1	11.33
Groupe Societe Generale	0,91	616	55,6	0.45	32.63
Danone	6	451	29.65	2.57	0.10
Dior	2.31	206 835	15.08	1.66	4.76
GDF Suez	4.86	4028.0	1.46	1.47	15.19
L'Oreal	4.3	1655.4	89.9	3.42	0.06
Michelin	1.9	65	140.8	1	75.5
Peugeot	-	0	-	0	-
Renault	-	0	-	0	-

Source: www.euronext.com.

Renault is the second largest French car manufacturer. The turnover on activities: sale of automobiles — 94.6%, services (sales financing, maintenance, support, warranty) — 5.4%. The geographical distribution of their turnover: Europe — 73.2%, America — 8.2%, Asia and Africa — 6.9%, 11.7% elsewhere.

Annual return allows the holder of the share to determine the effectiveness of investment as well as to relate it to the efficiency of investment in other actions.

Following the annual returns obtained above, we can see that the most effective title in 2009 was Danone. It should be also noticed that for Peugeot and Renault, neither profitability, nor other indicators could be calculated because the financial results of these companies were losses and dividends were not distributed. Therefore, without taking into account Peugeot and Renault, the reverse side of the matter (the title with the lowest efficiency) is **Groupe Societe Generale**.

The distribution of dividends is the modality by which a company rewards its shareholders, a similar way to that in which bondholders receive interest. This is a percentage set by the AGM of the net profit and varies according to the type of policy on issuing dividends of each company. The dividend distribution or non-distribution basically depends on the principle of profit or loss, but profit does not guarantee dividends. Dividends are not paid on the spot, the term of payment being established by AGA, as well as the type of payment, which can be cash or in shares; thus, a company retains profits and increases cash capital.

The dividend distribution rate represents the percentage of the yearly benefit distributed as dividends to shareholders. Its size depends on the decision on profit distribution; thus, when the dividend distribution rate tends to 100%, the situation is a result of a company's efforts to maintain shareholders' interest in its shares, for example L'Oreal, which has the dividend distribution rate of 89.9%.

For the companies as **Accor (140.2%)** and Michelin **(140.8%)**, the dividend distribution rate being over 100%, they have to rely on previously accumulated reserves for distribution as dividends.

If we consider that in the GDF Suez company (1.46%) the dividend distribution rate tends to 0, the conclusion refers to the concern of the company of ensuring self-financing by reinvesting profits.

The dividend per share is, for the owner of the action, the income produced by the investment that is a cash flow. In contrast, earnings per share represent an important part of stock valuing for the issuer. A high level of the dividend per share attracts investors seeking short-term secure returns, but on the other hand, its low level may be evidence for orientation of resources to various research projects, marking a good time to buy.

Concluding on the analysed results, we can say that the most attractive companies in this regard will be **L'Oreal (3.42 euros)** and **Danone (2.57)**.

PER is the capitalization coefficient which shows financial flows released by an action in relation to its real value. This can be interpreted in a twofold manner: the price which investors agree to pay in exchange for units of net profit per share, or the number of years needed to recover the invested capital, when all the profits made by a company are distributed to shareholders as dividends.

A high value of the indicator can show both an expensive action and trust in business. In this case we consider Michelin (75.5), Societe Generale (32.63) and Accor (31.11) as companies which enjoy a high degree of the investors' confidence regarding their business activities. With regard to risk, there is an inversed relationship between risk and PER; thus, the more reduced PER is, the higher the risk perception is as in the case of L'Oreal (0.06) and Danone (0.10), the opposite being Michelin (75.5), Societe Generale (32.63) and Accor (31.11), that have the benefit of lower risks. The growth of PER is influenced by the increased rate of return on equity and

dividend distribution rate and the reduction of PER rate is due to either a lower rate of return on equity and dividend distribution rate or to the amplification of the risk associated with securities.

2.3 Application of CAPM at the capital market in France. For the calculations, the necessary information for implementing the CAPM model was extracted from the www.euronext.com site and from the annual reports. Firstly, we calculate the volatility for each title:

$$R_{tl} = R_f + (R_M + R_f)\beta_1 \Rightarrow \beta_1 = \frac{R_{tl} - R_f}{R_M - R_f}.$$

Accor: $\beta = \dfrac{2.69 - (-2.6)}{5.96 - (-2.6)} = \dfrac{5.29}{8.56} = 0.62$

BNP Paribas: $\beta = \dfrac{1.79 - 2.9}{5.96 - 2.9} = \dfrac{-1.11}{2.79} = -0.4$

Groupe Societe Generale: $\beta = \dfrac{0.91 - 1.10}{5.96 - 1.10} = \dfrac{-0.19}{5.42} = -0.03$

Danone: $\beta = \dfrac{6 - 0.89}{5.96 - 0.89} = \dfrac{5.11}{5.07} = 1.01$

Dior: $\beta = \dfrac{2.31 - 1.29}{5.96 - 1.29} = \dfrac{1.02}{4.67} = 0.22$

GDF Suez: $\beta = \dfrac{4.86 - 2.53}{5.96 - 2.53} = \dfrac{2.33}{3.43} = 0.68$

L'Oreal: $\beta = \dfrac{4.3 - 0.21}{5.96 - 0.21} = \dfrac{4.09}{5.75} = 0.71$

Michelin: $\beta = \dfrac{1.9 - 2.67}{5.96 - 2.67} = \dfrac{-0.77}{3.29} = -0.23$

After determining the volatility of each title, we can proceed to calculate the average return of the portfolio:

$$\overline{R_p} = \tfrac{1}{n}(R_1 + R_2 + R_3 + \ldots + R_8),$$

where n represents the number of titles that make up the portfolio and R_1, R_2, … R_8 are securities portfolio returns.

$$\overline{R_p} = \tfrac{1}{8}(2.69 + 1.79 + 0.91 + 6 + 2.31 + 4.86 + 4.3 + 1.9) = \frac{24.76}{8} = 3.09$$

We will further determine the dispersion of the portfolio:

$$\sigma_p^2 = \tfrac{1}{n}\sum\nolimits_{i=1}^{n}(R_i - \overline{R_i})^2$$

where n is the number of titles that make up the portfolio and R_i the return securities and $\overline{R_i}$ the average return of portfolio securities.

$$\sigma_p^2 = \frac{1}{8}[(2.69\% - 3.09\%)^2 + (1.79\% - 3.09\%)^2 + (0.91\% - 3.09\%)^2 +$$
$$+ (6\% - 3.09\%)^2 + (2.31\% - 3.09\%)^2 + (4.86\% - 3.09\%)^2 +$$
$$+ (4.3\% - 3.09\%)^2 + (1.9\% - 3.09\%)^2];$$

$$\sigma_p^2 = \frac{1}{8}\left[\begin{array}{c} 0.16\% + 1.69\% + 4.75\% + 8.47\% + 0.61\% \\ + 3.13\% + 1.46\% + 1.41\% \end{array}\right] = \frac{21.7\%}{8} = 0.0271$$

Now we can determine the portfolio risk:

$$\sigma_p = \sqrt{\sigma^2} = \sqrt{0.0271} = 0.165.$$

If x_f is the risk-free asset in the portfolio share, the portfolio return is:

$$R_P = R_f \times x_f + \overline{R_P}(1 - x_f).$$

We will continue by giving different weights to the asset without risk and the portfolio return is calculated according to these:

a) $x_f = 0\% \Rightarrow 1 - x_f = 1 - 0\% = 1 = 100\%$

$$R_p = 2.6 \times 0\% + 3.09 \times 100\% = 3.09$$

b) $x_f = 20\% \Rightarrow 1 - x_f = 1 - 20\% = 0.8 = 80\%$

$$R_p = 2.6 \times 20\% + 3.09 \times 80\% = 0.52 + 2.47 = 2.99$$

c) $x_f = 40\% \Rightarrow 1 - x_f = 1 - 40\% = 0.6 = 60\%$

$$R_p = 2.6 \times 40\% + 3.09 \times 60\% = 1.04 + 1.85 = 2.89$$

d) $x_f = 60\% \Rightarrow 1 - x_f = 1 - 60\% = 0.4 = 40\%$

$$R_p = 2.6 \times 60\% + 3.09 \times 40\% = 1.56 + 1.24 = 2.8$$

e) $x_f = 80\% \Rightarrow 1 - x_f = 1 - 80\% = 0.2 = 20\%$

$$R_p = 2.6 \times 80\% + 3.09 \times 20\% = 2.08 + 0.62 = 2.7$$

f) $x_f = 100\% \Rightarrow 1 - x_f = 1 - 100\% = 0 = 0\%$

$$R_p = 2.6 \times 100\% + 3.09 \times 0\% = 2.6 + 0 = 2.6$$

The dispersion of the portfolio will be determined using the formula:

$$\sigma_p^2 = x_f^2 \times \sigma_f^2 + (1 - x_f)^2 \times \sigma_p^2 + 2x_f \times (1 - x_f) \times \sigma_p \times \sigma_f \times \rho_{pf},$$

but since $\sigma_f^2 = 0$ and $\sigma_f = 0$, consequently $\sigma_p^2 = (1 - x_f)^2 \times \sigma_p^2$

a) $x_f = 0\% \Rightarrow \sigma_1^2 = (1 - 0\%)^2 \times 2.71 = 2.71$

b) $x_f = 20\% \Rightarrow \sigma_2^2 = (1 - 20\%)^2 \times 2.71 = 1.73$

c) $x_f = 40\% \Rightarrow \sigma_3^2 = (1 - 40\%)^2 \times 2.71 = 0.97$

d) $x_f = 60\% \Rightarrow \sigma_4^2 = (1 - 60\%)^2 \times 2.71 = 0.43$

e) $x_f = 80\% \Rightarrow \sigma_5^2 = (1 - 80\%)^2 \times 2.71 = 0.11$

f) $x_f = 100\% \Rightarrow \sigma_6^2 = (1 - 100\%)^2 \times 2.71 = 0$

The mean square deviation of the portfolio will be:

a) $\sigma_1 = \sqrt{\sigma_1^2} = \sqrt{2.71} = 1.65$

b) $\sigma_2 = \sqrt{\sigma_2^2} = \sqrt{1.73} = 1.31$

c) $\sigma_3 = \sqrt{\sigma_3^2} = \sqrt{0.97} = 0.98$

d) $\sigma_4 = \sqrt{\sigma_4^2} = \sqrt{0.43} = 0.65$

e) $\sigma_5 = \sqrt{\sigma_5^2} = \sqrt{0.11} = 0.33$

f) $\sigma_6 = \sqrt{\sigma_6^2} = \sqrt{0} = 0$

The return-risk criterion can determine which is the best choice for the investor, by choosing the largest report:

a) $\dfrac{R_1}{\sigma_1} = \dfrac{2.69}{1.65} = 1.63$

b) $\dfrac{R_2}{\sigma_2} = \dfrac{1.79}{1.31} = 1.37$

c) $\dfrac{R_3}{\sigma_3} = \dfrac{0.91}{0.98} = 0.92$

d) $\dfrac{R_4}{\sigma_4} = \dfrac{6}{0.65} = 9.23$

e) $\dfrac{R_5}{\sigma_5} = \dfrac{2.31}{0.11} = 21$

f) $\dfrac{R_6}{\sigma_6} = \dfrac{4.86}{0} = 0$

Conclusions. The application of the CAPM at the capital market in France led to the following conclusion: looking at the results obtained above, we can notice that the best choice for investors in terms of the offered profitability and of the assumed risk is the Dior title.

As for the sensitivity rate of return relative to the overall market fluctuations, we can say, basing on the results, that the Danone title is offensive, increasing faster than the market, if it is growing, but at the same time, decreasing faster than the decreasing market.

This highly volatile action is very profitable in the situation in which the stock market rises because the holder will get significant gains.

Accor ($\beta = 0{,}62$), Dior ($\beta = 0{,}22$), GDF Suez ($\beta = 0{,}68$), L'Oreal ($\beta = 0{,}71$) are the securities which tend to follow market fluctuations, but in an attenuated manner. In contrast, BNP Paribas ($\beta = -0{,}4$), Groupe Societe Generale ($\beta = -0{,}03$), Michelin ($\beta = 1{,}01$) evolve in contradiction with the market, so if the market is increasing, the titles will fall and vice versa. In other words, these titles with negative beta are inversely correlated with the evolution of the index of reference, these titles influencing the market and not vice versa.

The individual title return offered by Michelin is less than risk-free asset ratio and the risk premium is negative, this situation being possible only for a short period of time and leading inevitably to a decrease rate.

It is recommended that the investors concerned with capital preservation should focus on the titles that have a low coefficient of volatility, such as Dior, Accor, GDF Suez or L'Oreal, while the investors willing to take big risks in trying to get big wins should invest in securities with higher volatility coefficient such as Danone.

As far as the portfolio on which the CAPM has been applied is concerned, it is noticeable that it has the 3.09 average return and risk associated with the 0.165, and the average market return is 5.96.

It is also worth noting that the optimal portfolio consists of 60% of assets without risk, due to the international financial crisis, and 40% of risky assets. This situation suggests a prudent behaviour of the investors who still persist in investing 40% of available funds in risky assets, a fact signifying the investors' level of expectancy for the situation improvement, signalled by the capital market is the most sensitive barometer of economic assets.

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